



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Sujian Huang *et al.*

Art Unit : 2128

Serial No.: 09/635,116

Examiner : F. O. Ferris III

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Title : METHOD FOR SIMULATING DRILLING OR ROLLER CONE BITS AND ITS
APPLICATION TO ROLLER CONE BIT DESIGN AND PERFORMANCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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DECLARATION UNDER 37 C.F.R. §1.131 Technology Center 2100

We, Christopher Cawthorne and Sujian Huang hereby declare that:

1. We are the sole inventors of the present application, *i.e.*, U.S. Patent Application No. 09/635,116.
2. We are currently employed by Smith International, Inc. ("Smith"), who is the assignee of the present application.
3. We conceived and worked on the reduction to practice of the primary embodiment of the invention in the present application, which is a software platform known as Integrated Dynamic Engineering and Analysis System ("IDEAS").
4. The invention in the present application was reduced to practice prior to August 31, 1998, the earliest filing dates of U.S. Patent Nos. 6,213,225 and 6,095,262.
5. The reduction to practice prior to August 31, 1998 of the present application is evidenced by at least the following Exhibits A-E. These exhibits represent a cross-section of files of Smith employees that developed and/or used IDEAS. While a significant amount of additional information exists, the attached

exhibits clearly illustrate that we were in possession of the claimed invention well before August 31, 1998

- Exhibit A shows several pages of screenshots of an IDEAS simulation conducted in May of 1996. The screenshots are of various graphical representations, including bottom hole patterns, bar charts of bottom hole coverage, bar charts of load (force) on each row, and bar charts of load on each cone.
- Exhibit B shows an email dated May 30, 1996 from James Minikus, identifying the first bits designed by Smith to be analyzed using IDEAS.
- Exhibit C shows slides of a PowerPoint® presentation of IDEAS, subtitled “An Advanced Tool to Simulate the Drilling Process (Full Scale Numerical Drilling Simulator).” This presentation was presented at a Smith director’s meeting in October of 1996.
- Exhibit D shows a planner insert from Scott McDonough, where a demonstration of the IDEAS was scheduled on February 20, 1997.
- Exhibit E shows an agenda of the F00 Bit Optimization Project, a PowerPoint® presentation of IDEAS (including the slides outline), subtitled “F00 Bit Optimization Project Smith International, Inc.,” graphical outputs from the F00 Bit Optimization Project (including screenshots from IDEAS

simulation runs), schematic drawings of bits designed during the F00 Bit Optimization Project, and text files output during the F00 Bit Optimization Project. The F00 Bit Optimization Project was a roller cone bit design project using IDEAS prior to the earliest effective filing date of U.S. Patent No. (s) 6,213,225 and 6,095,262. The project compared various bit designs in optimizing the overall bit design performance. The F00 Bit Optimization Project optimized various bit designs with respect to axial forces, bottom hole coverage, rate of penetration, *etc.*

6. The above Exhibits clearly disclose that each and every element of the claims of U.S. Patent Application Serial No. 09/635,116 was within our possession prior to the effective dates of U.S. Patent Nos. 6,213,225 and 6,095,262, namely, August 31, 1998. In particular, the above exhibits explicitly show that the IDEAS software was capable of at least the following features:
 - simulating the drill bit drilling through an earth formation, the simulating comprising calculating, from a geometry of cutting elements on each of the roller cones and at least one characteristic of an earth formation simulated as being drilled by the drill bit, an axial force acting on each of the cutting elements,
 - simulating incrementally rotating the bit and recalculating the axial forces acting on each of the cutting elements; repeating

the incrementally rotating and recalculating for a selected number of simulated incremental rotations;

- combining the axial force acting on the cutting elements on each one of the roller cones; and
- adjusting at least one bit design parameter, and repeating the simulating until a difference between the combined axial force on each one of the roller cones is less than a difference between the combined axial force determined prior to adjusting the at least one initial design parameter;

7. The Exhibits also clearly show that the following elements were in our possession prior to the earliest effective filing date of U.S. Patent Nos. 6,213,225 and 6,095,262:

- simulating the bit drilling through a selected earth formation;
- adjusting at least one design parameter of the bit;
- repeating the simulating the bit drilling; and
- repeating the adjusting and simulating until a distribution of an axial force on the bit is substantially balanced between the roller cones.

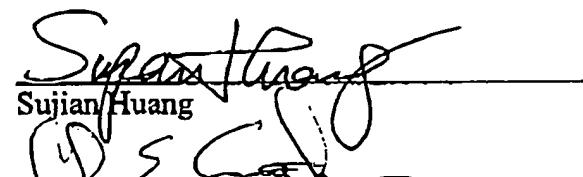
8. The reduction to practice of the invention in the present application continued to be diligently worked on and/or used from, at least, the dates established by Exhibits A-E until, at least, the date of constructive reduction to practice was established by the filing of U.S. Patent No. 09/524,088 on March 13, 2000.

I further declare that all statements made herein of my own knowledge are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such a willful false statements may jeopardize the validity of the application of any patent issued thereon.

Respectfully submitted,

Date: 3/18/04

Date: 3/22/04


Sujian Huang

Chris E. Cawthorne